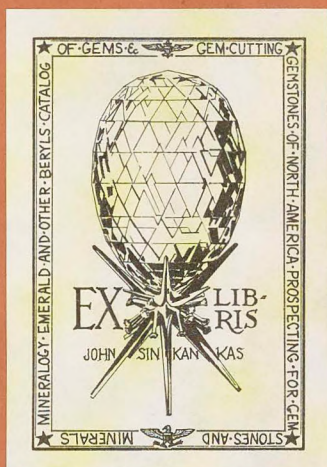


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NOTE ON THE REPORTED NAMSÈKA RUBY-MINE
IN THE MAINGLON STATE.

BY
FRITZ NOETLING, Ph.D.
PALÆONTOLOGIST, GEOLOGICAL SURVEY OF INDIA.



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Note on the reported Namsèka Ruby-mine in the Mainglôn State, by
FRITZ NOETLING, PH.D., *Palæontologist, Geological Survey of India.*

1. *Situation of the mine.*—Correctly speaking, the working which I am going to describe ought to be called the Namsèka Ruby-mine, because, from the name 'Ruby-mines of Mainglôn' hitherto used, one might be led to believe that these mines are close to the town of the same name. However, nothing could be more erroneous than such a supposition, as there are no rubies within a considerable distance around Mainglôn. The mine is situated about 15 miles to the south-west of Mainglôn in the narrow valley of the Nampai, also known in its lower course as the Maddaya river. The exact locality where rubies are said to have been obtained lies about half a mile to the north-west of a small village called Namsèka, close to the junction of a small stream (called Namsèka) with the Nampai on the left bank of

the former. Its geographical position, according to the fifth edition of the preliminary map of Upper Burma, will therefore be Long. $96^{\circ} 44'$, Lat. $22^{\circ} 46'$.

2. *Geology*.—The greater part of the strata developed in the northern and western part of the Mainglôn State belongs to the gneissic and sub-metamorphic formations, as the latter is called in the Manual of the Geology of India; and the smaller part consists of recent river deposits of the alluvial system. No other formations have been found in that part of the country, the azoic rocks forming the hills, while the alluvial deposits fill up the valleys in different grades of extension.

(a) *The gneissic formation*.—The gneissic formation is as regards the country between Mainglôn and Mogôk, developed to the north of the Nampai, but in its western continuation it forms the hills on both sides of the Nampai. As regards the mineralogical character it may be said that the gneiss shows a Himalayan character, being of white or greyish colour, the common feldspars being orthoclases and albite. The gneiss is well-bedded and dips about 50° towards north. It seems to be traversed by eruptive granite, as, on the road between Mainglôn and Namsêka, large boulders of this rock can be observed for a short distance. Owing to the dense jungle, I could not, however, ascertain its exact relation to the surrounding gneiss, but it seemed to me that it was true intrusive granite.

(b) *Sub-metamorphic shales*.—The sub-metamorphic shales covered a larger area in the country which I examined than the gneissic formation. The hills to the south, east, and west of Mainglôn are formed by strata belonging to this group. The strata are represented by red and greenish shales frequently intersected by veins of milky quartz rock (? fault-rock). This group seemed to be much contorted, as the directions of dip changed frequently.

(c) *Alluvial deposits*.—The alluvial deposits consist of coarse and fine gravels, layers of big well-rolled boulders, and tough, brown gritty clay, which contains numerous angular grains of quartz rock. In the Namsêka mines these different constituents of river deposits do not change regularly; they are deposited without order and thus prove that they have been deposited by a torrent, and not by a large stream. The section of the strata in the pit gives a very good idea of this irregularity of bedding. At the farthest end of the pit, big boulders cemented by a coarse gritty clay are found, which are covered by a thick layer of fine brown clay. A little nearer the river a bed of coarse clay is noticed at the same level as the large boulders, which is covered by a layer of gravel; the clay frequently contains pockets of gravel and sand or big boulders. The strata thus clearly indicate the action of a torrent, which washed away at one place, say, the heavy boulders, while it deposited a pocket of sand; behind a protected corner the next heavy flood deposited large boulders again, which were covered by a layer of clay, and so on.

The pebbles and boulders chiefly consist of milky quartz-rock; gneiss or granite are scarce; there are occasionally some specimens of a black or blue silicious shale, but no traces of any limestone. The absence of limestone must particularly be noticed because the crystalline limestone is the original matrix of rubies.

These alluvial deposits are the ruby-bearing strata, but it is only in the sand or gravel that rubies are found, not in the clay. This proves clearly enough that the Namsêka rubies are not found in the original matrix, but that they, like the rest of the pebbles, sand, &c., have been transported by the water from some place higher up the river, and (have been like the rest) deposited by the river along its course at localities which were favourable for the deposit. Having ascertained the nature of

the ruby-bearing strata; it was necessary to examine their extension, to find out whether they form a continuous bed along the banks of the river, or whether they were only deposited locally. This question was easily settled and it may be taken for granted that the river deposits do not form a continuous deposit, but that they are only found locally at places which were not only favourable for the deposit, but also protected the deposit once formed from being washed away again by the current. They therefore form mere pockets of no great extension which may be found anywhere along the bank of the Nampai or of the Mogôk stream. A description of the locality of the Namsèka ruby-mine will illustrate the nature of these pockets.

3. *Description of the locality.*—The Nampai, after having passed the broad valley of Mainglôn, has to cut its way through the gneissic rocks and the shales which form the hills west of the Mainglôn valley, making its way in a meandering course through the hills; its valley is frequently a narrow gorge through which the foaming waters flow with tremendous rapidity, while at other places, where the valley widens out a little, the river forms quiet pools, sometimes of considerable depth. Just before reaching the place where the ruby-bearing sands are now deposited, the Nampai comes down with tremendous speed from the north-east, but is checked in its course by a promontory on its northern bank, round which it has to make its way, taking then a northerly course. Just opposite to the promontory, on the left bank of the river, there was a small ravine, the outlines of which can still be traced. Along the slope of the hills it seemed to have had a very narrow outlet towards the river, while it widened out in its upper part. This ravine being well protected against the torrent coming from the east, nevertheless afforded an easy access to the water from the north, the bar at its end being low; particularly when at high flood the water was rushed against the promontory, and, being unable to find its way through a narrow passage, was forced into the ravine on the opposite bank; the ravine was thus gradually filled up by the detritus of the Nampai. Subsequent floods may have partly washed away the deposits which were most exposed, while others may again have increased their quantity, but the bulk was deposited safely in the hollow of the ravine.

I estimate the height up to which the ravine was filled to be about 50 to 60 feet above the level of the Nampai at low water.

4. *Description of the pit.*—The pit was about 400 feet in length, contracting at its northern end to a narrow passage just sufficient to afford passage for one man; it widened out to about 150 feet on the surface, but the bottom, where the men worked, hardly afforded room for two men to excavate the sand. The pit was therefore a funnel-shaped hole in which the workmen had to work under permanent danger of their lives, as the sides, not being supported by timber, might give way any moment, and fill up the whole pit.

(f) *Manner of washing for rubies.*—To facilitate the digging, the former workmen had constructed a small channel bringing the water to the top end of the pit where it was made to run down the walls, thus softening the hard clay. The workmen then put the sand or gravel into small baskets, which were brought down to the river, where they were put into flat baskets, and by a rocking movement in the water, the clay was first removed. If there were any stones of particular size they could then be noticed and picked out, the larger pebbles thrown away and the remainder carefully washed under a permanent rocking movement. If repeated

two or three times, and no rubies were discovered, the whole sand in the basket, which by this time had been reduced to fragments of the size of a pea, was thrown aside.

(g) *My experiments.*—When I visited this pit it showed signs that it had not been worked for a long time. I therefore expected to get good results. My trials were repeated for three days, each day working for eight hours with 12 coolies. The coolies were carefully watched, not only while digging, but particularly during the operation of washing. I was therefore quite sure that any theft of stones was impossible. I proceeded in the same way as the natives were accustomed to do. The ruby-bearing sand, when brought out of the pit, was a dirty, clayey earth which made any mineral, even the pure white quartzite pebble, perfectly indiscernible; to pick out any ruby from this stuff in the short time within which it was brought from the pit to the river would, in my opinion, have been impossible. I even doubt whether the men working in the pit could have abstracted any stone provided it were not an exceptionally large one, so completely did the brown clay conceal the true nature of every pebble or stone. After the first washing there remained a gravel chiefly composed of white quartzite pebbles and a finer sand composed of various rocks and minerals. When the larger pebbles were removed and the finer sand was repeatedly washed, there was left a sand consisting chiefly of quartzite in various colours, those of milky colour prevailing, numerous spinels, a few crystals of hæmatite and occasionally a fragment of titanite or schorl (black tourmaline), but no rubies. It must particularly be mentioned that all these minerals were found in angular fragments, having sharp edges; hardly a single specimen was rolled. This is certainly a proof that they could not have been transported for a long way, or else they would have lost their angular shape.

I paid of course special attention to all “red” minerals, but they all proved to be spinels, not a single ruby being amongst them. The spinels were all of the same poor colour, dark purple, nearly black, and none of the fragments were of any size worth mentioning. The surface of the spinels had a peculiar appearance; it was honeycombed and the cells were filled with a yellow, soft mineral which I suppose to be hydroxide of iron, and which could be removed entirely by washing and brushing. This may be considered as the first sign of superficial disintegration. Specimens were not unfrequently met with, which had turned into hydroxide of iron, still preserving, however, their original shape.

(h) *Do the Namsèka ruby-mines contain rubies or not?*—The first samples of rubies which were sent by Lieutenant Daly, Superintendent, Northern Shan States, to the Government of Burma, and which were said to have come from the Mainglôn ruby-mines, were exceedingly fine specimens. They were not large, but of very good colour, some of them nearly flawless and nearly all well crystallized, or if fragments, showing at least a few crystal faces; the edges were all sharp, and not water-worn. A mine producing such stones was certainly very promising, and I was therefore much surprised that I did not find during these three days, with 12 coolies working 8 hours each, a single ruby, and not even a fragment. This was most surprising, as it might fairly be expected that the trials were sufficient to prove the existence of rubies if there were any. I therefore felt inclined to think that the Namsèka ruby-mines must have been either worked out, or that they never produced any rubies at all. As they were not exhausted, that is to say, as the total of the alluvial deposits

had not been exploited, I could only accept the conclusion that they did not contain any rubies at all.

Strange to say this conclusion was supported by a most remarkable story about the origin of the rubies sent to the Government. When the Thibaw Sawbwa sent one of his officials to Namsèka to get samples of good stones from the mines, none could be procured. The man therefore went over to Mogôk, where he purchased the stones which were handed over to the Sawbwa as "Namsèka rubies." I give this story as it was told me, and I do not venture to use it in any way to support my views about the value of the Namsèka ruby-mines. I must, however, mention that it was told voluntarily to me, and that the informer did not know the view I held about the mines.

On my way back, passing Thibaw, I told the Sawbwa my doubts as to the Namsèka mines; but he produced a large tray of rubies, amongst which were some excellent stones of good colour which in their appearance perfectly agreed with the stones forwarded by Lieutenant Daly to the Government; and he assured me that all these stones came from the Namsèka mines. To do him justice, I must admit that the samples shown to me contained all sorts of stones, rubies of different colours and shapes, rolled and crystallized, numerous fragments of spinels, of the same appearance as the Namsèka spinels, and a number of minerals, such as are associated with rubies and spinels. Had these samples actually been bought at Mogôk the man who bought them would have shown a good deal of foresight by also buying minerals which, though valueless in themselves, are found together with rubies, so as to make the fraud a complete one. I must admit that with these reflections and in the face of the positive statements of the Sawbwa, I do not feel justified in giving a final decision about the value of the Namsèka ruby-mines without having examined them again, and for a longer time.

Several questions, however, first require answering, namely,—

(a) Were the ruby-mines which I visited and examined actually those from which the stones in the possession of the Sawbwa had been obtained? As to this there can be no doubt that I actually visited the place from which the rubies were stated to have come. The mine was fenced in, there was an old guard-house to prevent outsiders from digging, and there is no room for any other ruby-bearing deposit round Namsèka. Besides, the Sawbwa was most anxious to learn something about his valuable mining property, so that I do not see any reason why he should have deceived me by sending me to the wrong place. Furthermore, Mr. Hertz, who has stayed for several months at Mainglôn, has only heard of one ruby-mine near Namsèka; and he would certainly have heard if there had been more mines from which rubies had been extracted, along the bank of the Nampai, if such mines were in existence; because, as far as I know, the first information about the Mainglôn ruby-mines came through Mr. Hertz. Taking everything into consideration there can be no doubt as to the identity of the "Namsèka" ruby-mines.

(b) The question as to the locality having been answered in the affirmative the next question to be answered is—Are the rubies found in certain strata, or are they to be found irregularly distributed amongst the alluvial deposits described in paragraph 2(c)? If the rubies are confined only to a certain stratum or strata, then I must admit that either my operations did not touch such or else that they were completely exhausted by former diggings and had consequently disappeared. Now

from the nature of these deposits I doubt that regular beds existed, for the section as exhibited in the pit shows clearly that there is no regularity as regards bedding; the theory of a regular ruby-bearing bed must therefore be dismissed as not being in accordance with the nature of the deposits, and it is more likely that the rubies are distributed irregularly, like any other pebbles or minerals through the whole of the deposits. This may, however, be restricted in some way; there may have existed a pocket of sand or gravel which was particularly rich in rubies, and it may have been from this pocket that the Sawbwa's stones came. This pocket having been completely worked out, the other strata do not contain rubies at all or only in great scarcity. It seems to me that this theory about the occurrence of the rubies is the more probable one, but it can only be tested by a repeated and more extended examination.

5. *The origin of the rubies.*—However, supposing the rubies were actually found in the Namsèka; from the way in which they were found, there cannot be the slightest doubt but that they are not in their primary matrix. They form part of the river deposits, and have been transported by the river, like other stones, from some spot higher up, and they no more originate in the spot in which they are found than the ordinary river gravel. In paragraph 2, I particularly mentioned that no crystalline limestone, the original matrix of rubies, has been found yet. These two observations prove that the rubies cannot come from the immediate neighbourhood of Namsèka, although from their shape it may be concluded that the original matrix which yields the rubies cannot be very far away.

Now, fortunately there is absolute proof that the rubies cannot have been washed down by the Nampai. I examined the deposits of the Nampai around Mainglôn and did not find a ruby or spinel or even fragments of these stones. As they extend to about 10 miles east of Namsèka, the locality from which the rubies came must necessarily be situated between Namsèka and the western limit of the river gravels of Mainglôn. As there is, however, no crystalline limestone, we must suppose that they were brought down by a stream coming from the north. The only stream of importance is the Mogôk stream, which joins the Nampai about a quarter of a mile above the Namsèka ruby-mines, and it may therefore be supposed with a great degree of probability that any rubies found in the Namsèka mines have been washed down from the ruby-mines district by the Mogaung river.

6. *Probable extension of Ruby-bearing sands in the valley of the Nampai and Mogôk streams.*—Having in the previous paragraph pointed out the way in which the rubies said to have come from the Namsèka mines may have been transported, the question to be answered is whether there is any probability of any more ruby-producing localities being discovered along this way. This question may be answered in the affirmative, and it may be stated that there is the greatest probability of discovering such deposits along the bank of the Mogôk stream, but that the chances get fewer by going farther down the Nampai, provided there is no other feeder from the ruby-bearing strata of the Ruby Mines district. From the nature of the deposits in which rubies are found it may, however, be concluded that they nowhere cover a large area; at suitable places, in small ravines or behind a hill projecting into the river, they may be looked for and met with, but these pockets would soon be exhausted; and I therefore doubt whether it would pay a European company to work these deposits the real value of which has, moreover, not been ascertained.

The following is a summary of the facts which have so far been obtained as regards the occurrence of ruby-bearing deposits in the valley of the Nampai, generally known as the Mainglôn ruby-mines :—

- (a) the rubies are not found in their primary matrix ;
- (b) the rubies are found in secondary deposits, namely river gravel and sand ; they have therefore been removed by the action of the water from the place when they originally existed ;
- (c) the river deposits (gravel and sand) do not form a continuous layer along the banks of the river ;
- (d) they are found at isolated places, which were suitable for their deposit and preservation, thus forming pockets of very limited horizontal extension, and also hardly reaching higher up than 50 or 60 feet above the low water-level ;
- (e) there is, however, every probability that along the banks of the Mogôk stream and Nampai more such pockets as the Namsèka ruby-mine may be discovered ; the chances, however, get less with increasing distance from the place where the Mogôk stream joins the Nampai ;
- (f) unless a large number of such pockets are discovered, it would not pay systematic exploitation, even should rubies be found ;
- (g) it is still doubtful whether the Namsèka ruby-mine ever produced rubies, or whether it will produce them in the future.

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